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(54) Title: DECORATIVE COMPOSITE FLOOR COVERINGS

(57) Abstract

This invention relates to a composite floor covering having a lower cushioning layer, at least one dimensionally stabilizing intermediate layer, and an upper layer of a decorative fabric. At least the upper surface of the decorative fabric has a protective polymeric coating. The floor covering has a resiliency of no greater than about 55 % and a density of at least about 10 lbs/ft^3.

TITLE

DECORATIVE COMPOSITE FLOOR COVERINGS

FIELD OF THE INVENTION

This invention relates to a composite floor covering having medium resilience and good cushioning properties. More particularly, this invention relates to a composite floor covering having a lower cushioning layer, at least one dimensionally stabilizing intermediate layer and an upper layer of a decorative fabric, wherein the decorative fabric has a protective polymeric coating.

BACKGROUND OF THE INVENTION

Decorative floor coverings such as carpets and vinyl flooring are well known. Carpets offer greater comfort than vinyl flooring due to their soft, cushioning feel and better warmth. However, vinyl floor coverings are easier to clean than carpets and are available in a wider variety of decorative designs. There would be great utility in having a single floor covering which combines the advantages of carpet and vinyl flooring.

U.S. Patent No. 4,018,957 discloses a soft floor covering made of a decorative fabric, the upper surface of which is treated with a transparent wear layer of polyurethane or polyvinyl chloride (PVC). The lower surface of the fabric is attached to a resilient backing layer of 50-250 mils in thickness, preferably of PVC. There is no stabilizing layer between the decorative fabric and the resilient backing.

U.S. Patent No. 2,688,578 discloses an elastic decorative fabric bonded to a resilient backing pad. The backing pad is preferably sponge rubber several times thicker than the fabric. The

make it dimensionally stable. Also, the upper surface of the decorative fabric lacks a polymeric coating for improved wear and resistance to staining and soiling.

French Patent No. 2,160,631 discloses a decorative composite material composed of a surface layer made from a stabilized knitted fabric, having a decorative design printed onto the visible surface, and a backing layer made from an elastic polymer material. The upper surface of the decorative fabric lacks a polymeric coating for improved wear and resistance to staining and soiling.

There exists a need for a soft, reinforced, decorative composite floor covering which has the good cushioning feel of a pile carpet when walked on, while maintaining the dimensional stability necessary to prevent permanent deformation to its surface due to such forces as chair legs, foot traffic and the like. Also the decorative fabric surface layer should be resistant to abrasion, staining, and soiling and be easy to clean. The present invention provides such a composite floor covering. This floor covering has medium resilience and good cushioning properties making it suitable for use in a variety of residential rooms such as kitchens, bath, utility, and family rooms.

SUMMARY OF THE INVENTION

This invention relates to a composite floor covering material comprising a decorative fabric layer, at least one stabilizing layer, and a cushioning layer. The decorative fabric has an upper and lower surface and at least the upper surface is coated with a protective polymeric coating. For some applications, the lower surface may be coated with the same or different protective

By the term, "decorative fabric" as used herein, it is meant a planar textile structure composed of yarns, fibers, or filaments and having an upper surface (facing) and lower surface, wherein the facing of the fabric provides a decorative effect. At least the upper surface is coated with a protective polymeric coating and the lower surface may be coated with the same or different protective polymeric coating. The lower surface of the decorative fabric is attached to a stabilizing layer (as described further below). These fabrics, wherein the decorative effect is provided by the fabric itself, differ from fabrics having a printable or decorable polymeric coating on their surface which are described in U.S. Patent 3,620,890. In the present invention, colors and designs can be applied to the fabrics by conventional techniques such as by dyeing the yarns, fibers or filaments which compose the fabric or by dyeing or printing the fabric itself. For example, in solution-dyeing processes, pigments are added to the fiber-spinnable polymer melt or solution prior to extrusion of the melt or solution through a spinneret to form solution-dyed fibers. Alternatively, the fibers may be pre-dyed by such techniques as "stock-dyeing" (the dyeing of fibers in staple form). Alternatively, the yarn may be pre-dyed before it used to form a fabric. Yarn dyeing techniques include skein-dyeing and space-dyeing. Dyed yarns of different colors may be used to give the fabric multicolored patterns.

A second method for imparting color to fabrics is printing. In general, printing involves applying coloring agents onto the fabric which is then treated with heat or chemicals to fix the coloring agents. Printing techniques include, for example, pigment printing, roller printing, screen printing, and heat transfer printing.

Generally, non-woven fabrics refer to an assembly of textile fibers held together by interlocking in a random web or mat, by fusing of the fibers, or by bonding with an adhesive. Spun-bonded fabrics, such as Tyvek® or Typar® which are available from the DuPont Company, are composed of randomly arranged, continuous filament fibers bonded at filament cross-over points. These fabrics are lightweight and have good tensile and tear strengths. Spun-laced fabrics, such as Sontara® which is available from the DuPont Company, are composed of of fibers entangled in a predetermined repeating pattern to form a strong, non-bonded structure.

Generally, knitted fabrics refer to fabrics which are constructed by interlocking a series of loops of one or more yarns. In warp knitting, the yarns generally run lengthwise in the fabric. In weft knitting, one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting includes circular knitting and flat knitting. In circular knitting, the fabric is produced on the knitting machine in the form of a tube, wherein the threads run continuously around the fabric. In flat knitting, the fabric is produced on the knitting machine in flat form, wherein the threads alternate back and forth across the fabric.

For purposes of this invention, the decorative fabric preferably has a weight of about 1 to about 20 ounces per square yard and a thickness of about 20 mils to about 200 mils. More preferably, the decorative fabric has a weight of about 5 to about 20 oz/yd^2 and a thickness of about 35 mils to about 135 mils. These fabrics are especially suitable for use as an upper layer in the

also be used. It is also understood that mixtures and blends of the above-described polymer compositions may be used, and that the coatings may contain other additives such as antimicrobial agents, UV stabilizers, antioxidants, and fillers.

The lower surface of the decorative fabric may also be coated with a polymeric coating which does not necessarily have to be transparent. This polymeric coating may comprise the same or different compositions than the polymeric coating used for the upper surface. For instance, it may be desirable to use a polymeric coating comprising a water repellent agent as described in U.S. Patent 4,642,930 on the lower surface of the decorative fabric to render the decorative fabric impervious to liquid spills, while a poly(vinyl chloride) resin coating is used on the upper surface or vice versa.

The thickness of the polymeric coating is typically in the range of about 0.5 mils to about 40 mils depending on the type of polymeric coating used. The polymeric coating may be applied to the fabric by such known techniques as extrusion, spraying, dipping, knife coating, transfer coating, or by lamination. In some instances, the polymeric coating may be subsequently cured by thermal heating, UV light, or fusion. In some instances, it is desirable to have the polymeric coating calendered or embossed onto the upper surface of the decorative fabric for special decorative effects.

It is also recognized that it is not necessary to apply the polymeric coating directly onto the fabric. Rather, the polymeric coating may be applied to the fiber before the fiber is used to construct the fabric or after the composite floor covering is installed.

temperature and humidity. For purposes of this invention, the thickness of the scrim should generally be in the range of about 3 to about 250 mils.

The scrim may be produced by such techniques as described in U.S. Patents 3,728,195, 4,030,168 and 4,762,744. Typically, the amount of strands running in the "machine direction" (length direction), i.e., the direction in which the scrim is being produced by the machine and the amount of strands running in the "cross direction" (width direction), i.e., the direction perpendicular to the direction in which the scrim is being produced by the machine are equal. The strands should also be equally spaced apart in the length direction and width direction.

Fibrous non-woven sheets are described above and include spun-bonded fabrics such as Tyvek® and spun-laced fabrics such as Sontara® available from the DuPont Company. Thermoplastic compounds can also be used to make sheet materials having good stabilizing properties.

In addition to scrims and sheet materials, other materials may be used as the stabilizing layer. For example, velours, felts, woven, knitted, flocked, needle-punched and fusion-bonded fabrics may be used along with poly(vinyl chloride) resins, foamed urethane, and composite structures such as PVC vinyl flooring. These materials may be used independently or in combination with each other. For instance, the stabilizing layer may comprise a non-woven sheet adhered to a scrim. It is also recognized that these materials may be used in combination with each other. The type of material used for the stabilizing layer will vary depending on the desired properties of the composite floor

some instances, it may be desirable to have the stabilizing layer simply lay on the cushioning layer.

The cushioning layer may comprise any suitable material such as for example, foamed compositions of rubber, latex, hot-melt resins, urethane, poly(vinyl chloride) resins. These compositions may be combined with fabrics such as velours, felts, wovens, non-wovens, knitted, flocked, needle-punched, and fusion-bonded to provide a good cushioning layer. Carpets such as unitary carpets and particularly tufted carpets having a tufted primary backing laminated to a secondary backing may also be used. The thickness of the cushioning layer is at least 0.1 inches and is preferably in the range of about 0.125 inches to about 0.625 inches. Preferably, the density of the cushioning layer is greater than 3.0 lbs/ft^3. The thickness and density of the cushioning layer are significant, because these properties help provide the desired resilience and cushioning effect to the entire floor covering. Cushioning layers having certain physical properties are insufficient to provide the floor covering with the desired resiliency as shown in Comparative Example A below.

More particularly, the cushioning layer provides the composite floor covering of this invention with a resiliency of no greater than about 55% and a density of at least about 10 lbs/ft^3.

It may be desirable to vary the resiliency level and density of a composite floor covering, within the above-specified ranges, depending on the location where the floor covering is to be installed. For instance, if the floor covering is intended for use in a kitchen or utility room, it may have a low resiliency and high density to

to the lower surface of the stabilizing layer. This may be done by spraying the tufts and decorative fabric with an adhesive.

In some instances, a carpet having a tufted primary backing laminated to a secondary backing or carpet tiles may be used as the stabilizing layer and cushioning layer. The secondary backing in tufted carpets is a particularly effective stabilizing layer, because it is typically a polypropylene scrim which is laminated to the tufted primary backing by latex and this scrim can be readily attached to the underside of the decorative fabric. The tufted primary backing is a particularly effective cushioning layer, because of the tufted yarns (pile). The pile height, density, and weight may be adjusted to give the desired cushioning effect. Further, such a floor covering may be reversed in order to use the tufted primary backing layer as the surface layer. This would be particularly desirable in instances where good quality, colored, tufted yarns are used in the primary backing.

The present invention is further illustrated by the following examples, but these examples should not be considered as limiting the scope of the invention. The following Test Methods were used to measure the properties described in these examples.

TEST METHODS

PUNCTURE RESISTANCE - This test measures the energy required to puncture a material. Results are expressed as puncture resistance per unit area of the measurement probe. Samples are first conditioned at 75+/- 2°F and at 55 +/- 2% relative humidity (RH) for at least 24 hours. The sample to be tested is then clamped taut in a frame mounted on an Elmendorff tear tester equipped with a Spencer

approximately 3.5 oz/yd^3 of the following compound: 20% Rhoplex HA-8 and 10% Acrysol ASE-60, both available from Rohm and Haas, 2.5% Ammonia, 62.5% Water and 0.5% Zonyl® 7040. The backcoated fabric was then dried at 325°F for 1 minute. The treated fabric was then adhesively attached to the upper surface of the stabilizing layer with approximately 18 to 20 oz/yd^2 of a styrene-butadiene rubber (SBR) latex 9070. The stabilizing layer was composed of a woven polypropylene backing of 8 x 8 threads per inch, having a thickness of 1.274 mm and weighing about 3.4 oz/yd^3. A needlepunched fabric with a rubber backing and a thickness of 0.285 inches and a weight of 44.6 oz/yd^2 was used as the cushioning layer. The lower surface of the stabilizing layer was adhesively attached to the fabric side of the cushioning layer using the above-described SBR latex. The composite floor covering sample was allowed to dry at room temperature for 24 hours in order for the adhesives to dry. The resiliency and density of the floor covering are reported in Table 1. The puncture resistance of the floor covering was 1092 in-lb/in^3.

Example 2:

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared as described above in Example 1, except a fusible web, weighing 2.8 oz/yd^2 and having a thickness of 0.23 mm was used as the stabilizing layer in place of the polypropylene backing and no latex adhesive was used. Rather, this web was heat-laminated and bonded to the lower surface of the decorative fabric and adhered to the upper surface of the cushioning layer using about 8 oz/yd^2 of a spray adhesive (Sparayway No. 55 available from Sprayway, Inc.). The resiliency and density of the floor covering are reported in Table 1. The

puncture resistance of the floor covering was 1092 in-lb/in^2.

Comparative Example A

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared as described above in Example 1, except a polyurethane foam cushion having a thickness of 0.34 inches, a weight of 12.2 oz/yd^2 and a density of 3.0 lb/ft^3 was used as the cushioning layer. The resiliency and density of the floor covering are reported in Table 1. The puncture resistance of the floor covering was 1068 in-lb/in^2.

CLAIMS:

1. A composite floor covering material, comprising:

a) a decorative fabric layer having an upper and lower surface, wherein at least the upper surface has a protective polymeric coating;

b) at least one stabilizing layer having an upper and lower surface; and

c) a cushioning layer having a thickness of at least 0.1 inches, wherein the lower surface of the decorative fabric layer and the upper surface of the stabilizing layer are attached to each other and the lower surface of the stabilizing layer is in contact with the cushioning layer, said floor covering having a resiliency of no greater than about 55% and a density of at least about 10 lb/ft^3.

2. The composite floor covering of claim 1, wherein the puncture resistance of the floor covering is at least about 800 $in\text{-}lb/in^2$.

3. The composite floor covering of claim 1, wherein the protective polymeric coating on the upper surface of the decorative fabric comprises a polymer selected from the group consisting of poly(vinyl chloride), plastisols, polyurethane, stain-resist agents, soil-resist agents, water-repellent agents, fluorochemicals, silicones, acrylics, and mixtures thereof.

4. The composite floor covering of claim 1, wherein the protective polymeric coating comprises a polymeric film.

5. The composite floor covering of claim 3 or 4, wherein the protective polymeric coating has been calendered or embossed on the upper surface of the decorative fabric.

14. The composite floor covering of claim 1, wherein the cushioning layer comprises a foamed composition selected from the group consisting of rubber, latex, urethane, and poly(vinyl chloride).

15. The composite floor covering of claim 1, wherein the cushioning layer comprises a fabric selected from the group consisting of velour, felt, woven, non-woven, knitted, flocked, needle-punched, and fusion-bonded fabrics.

16. The composite floor covering of claim 1, wherein the cushioning layer comprises a carpet.

17. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by latex adhesives selected from the group consisting of styrene-butadiene rubber, styrene/acrylate copolymers, carboxylated vinylidiene chloride/butadiene copolymers, styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, and blends thereof.

18. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by thermoplastic adhesives selected from the group consisting of polyvinyl chlorides, polyurethanes, polyolefins, ethylene/vinyl ester copolymers, ethylene/alkyl (meth) acrylate copolymers, ethylene/olefin copolymers, and mixtures thereof.

19. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by a hot-melt adhesive comprising a thermoplastic resin.

surface of the decorative fabric layer and the upper surface of the stabilizing layer are attached to each other and the lower surface of the stabilizing layer is attached to the backing of the pile of the cushioning layer, said floor covering having a resiliency of no greater than about 55% and a density of at least about 10 lbs/ft^3.

INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/US 96/10622

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D06N7/00 B32B5/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D06N B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB,A,1 194 027 (MONSANTO TEXTILES LTD.) 10 June 1970 cited in the application see the whole document ---	1-15,17, 21
Y	US,A,4 018 957 (WERNER JESSE ET AL) 19 April 1977 cited in the application see column 2, line 67 - column 3, line 67; claims 1-7; figure 1 see column 6, line 9 - line 28 ---	1-15,17, 21
A	FR,A,2 160 631 (LEVY ALBERT;FERBER WALTER) 29 June 1973 cited in the application see the whole document --- -/--	1-15

[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

...formation on patent family members

Intern... al Application No
PCT/US 96/10622

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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US-A-4018957	19-04-77	DE-A-	2626171	22-12-77
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